



## COMPRESSED GAS OPERATED PISTOL

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

[1] This invention concerns a compressed gas operated pistol, and, more specifically, a compressed gas operated pistol that comprises a sealing element to isolate the chamber with respect to the opening of the ammunition magazine at the time of firing.

#### 2. Background of the Related Art

[2] Conventional art compressed gas operated pistols essentially comprise a support casing that defines a barrel zone, a trigger zone and a stock zone. The barrel zone contains a barrel with the rear end facing a chamber. In the trigger zone, there is a trigger connected to a hammer operating mechanism. In the stock zone, there is an ammunition magazine arranged to insert a pellet into said chamber through an opening prior to each shot. A pressurised gas cylinder with a valve chamber which, in turn, is connected to said chamber via a valve element pushed by an elastic means towards a closed position. Said valve element can be instantly moved to an open position by impact from said hammer.

[3] One inconvenience presented by these conventional art pistols is that the magazine has said opening, through which the pellets enter the chamber, formed by an opening in an interior chamber wall, and this causes part of the pressurised gas supplied by the valve element to escape at the moment of firing, through said opening towards the interior of the magazine and which is not employed in impulsion for the pellet. In other

words, there is a loss of the energy supplied by the gas pressure leading to a reduction in pellet range.

### SUMMARY OF THE INVENTION

[4] The objective of this invention is to provide a compressed gas operated pistol that comprises a sealing element operated by the trigger to isolate the chamber with respect to the ammunition magazine opening at the time of firing.

[5] This objective is reached, in accordance with this invention, by providing a compressed gas operated pistol of the type described above, in which said barrel is able to move and is guided linearly to cause a movement of a rocker in an axial direction. This moving barrel is linked to said trigger and an elastic element is arranged to push the trigger and barrel assembly forwards to an inactive position. Said link between the trigger and barrel is such that, when the trigger is pressed against the force of said elastic element, the trigger moves the barrel backwards, thus operating a sealing element arranged so that it isolates the chamber with respect to the ammunition magazine. Preferably, said sealing element comprises a thin cylindrical wall directly arranged in said rear end of the barrel, defining an interior surface that is a continuation of the barrel bore surface, an exterior surface that can be adjusted inside the interior surface of the chamber, and a final perimeter edge. This thin cylindrical wall is arranged in such a manner that, when the barrel is moved backwards by the trigger, the thin cylindrical wall fits tightly into the chamber, collecting on its passage along the path said pellet, which is located in the chamber, until said final perimeter edge is supported against the rear surface of the chamber, thus sealing the entrance for the

compressed gas. In this position, the thin cylindrical wall arranged in the rear end of the barrel takes over the functions of the chamber and, at the same time, the exterior surface of the thin cylindrical wall closes off the magazine opening to guarantee that the gas released during firing passes into the barrel bore and all its energy is fully employed in driving the pellet forward.

[6] As is usual, the ammunition magazine comprises an ammunition store forming a column of several pellets. This store communicates with the chamber through said opening and a spring-loaded ammunition push mechanism is arranged to push said column of pellets towards the chamber, with the last (uppermost) pellet in the column remaining in the chamber.

[7] In order to prevent the final perimeter edge of the thin cylindrical wall, upon penetrating the chamber, from trapping the penultimate pellet against the rear wall of the chamber, which would make firing impossible, this invention provides a means to prevent this, comprising a trap that is jointed with respect to a shaft and arranged in said opening between said ammunition store and the chamber. In the non-operational position, this trap is pushed upwards by the penultimate pellet in the column by virtue of the magazine spring force, and is set with one end arranged between said penultimate pellet and the last pellet, which is now located in the chamber. When the thin cylindrical wall of the rear end of the barrel enters the chamber, the final perimeter edge pushes said trap downwards, which drags along the penultimate pellet and with it, the rest of the column against the force of said magazine spring, leaving the last pellet free in the chamber so that it can be collected inside the thin cylindrical wall. For this reason, the trap has a suitable transverse section profile. As

is usual, the outside diameter of the pellet is slightly less than the inside diameter of the barrel bore to ensure that the pellet does not fall out of the barrel muzzle and to prevent loss of pressure between the pellet and the barrel.

[8] Additional advantages, objects, and features of the invention will be set forth in part in the description which follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from practice of the invention. The objects and advantages of the invention may be realized and attained as particularly pointed out in the appended claims.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

[9] These and other characteristics and advantages are better understood from the following detailed description of a constructional example, with reference to the included drawings, in which:

[10] Fig. 1 is a perspective view of the compressed gas operated pistol in accordance with this invention;

[11] Fig 2 is a longitudinal sectional view of the pistol shown in Fig.1;

[12] Fig. 3 is an enlarged view of area III of Fig. 2, showing a part of the mechanism in a resting position;

[13] Fig. 4 is an enlarged view of area III of Fig. 2, showing a part of the mechanism in a firing position;

[14] Fig 5 is a side view of a portion of the mechanism, in which the casing outline is shown by the dotted and broken lines;

[15] Figs. 6 and 7 are longitudinal sectional views of the sliding cover in resting and firing positions, respectively, and in which a casing outline is shown in dotted lines, and other mechanism outlines are shown in broken lines.

[16] Fig 8 is a transverse sectional view taken at line IX-IX of Fig. 5, and

[17] Fig 9 is a transverse sectional view of the case, which includes the magazine and gas cylinder removed from the stock zone.

#### **DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS**

[18] First referring to Figs. 1 and 2, the compressed gas operated pistol of this invention comprises a support casing 26, which defines a barrel zone 1, a trigger zone 4, and a stock zone 7. In the barrel zone 1, there is a barrel 2, with rear end 2a facing a chamber 3. In the trigger zone 4, there is a trigger 5 connected to an operating mechanism for a hammer 6. In the stock zone 7, there is an ammunition magazine 8, arranged to insert a pellet 9 in said chamber 3, prior to each shot, and a pressurised gas cylinder 10 communicating with a valve chamber 11. This valve chamber 11 is in turn, connected to said chamber 3 by means of a valve element 12, which is pushed by elastic means (not shown) towards a closed position and which can be instantly moved to an open position by an impact from said hammer 6.

[19] As shown in Fig. 2, and in accordance with this invention, barrel 2 is able to move and is linearly guided in order to carry out a rocking movement in an axial direction. Barrel 2 is also linked to said trigger 5 by a catch 47, which is firmly fixed to the barrel 2 and inserted into a cavity 46 in a trigger piece 5a, of which trigger 5 forms an integral part. Said

trigger piece 5a is installed in said trigger zone 4 so that it is able to slide guided linearly in a direction parallel to the barrel 2 axis, which is described in more detail with reference to Figs. 5 and 8, and an elastic element 51, such as an elastic traction spring, is arranged to push the trigger 5 and barrel 2 assembly forwards to a resting position. When trigger 5 is pressed against the force of spring 51, cavity 46 drags the barrel 2 backwards, operating sealing elements 2b, 2c in order to isolate the chamber 3 with respect to the ammunition magazine 8.

[20] As shown in Figs 3 and 4, said sealing elements 2b, 2c comprise a thin cylindrical wall 2b that fits into said rear end 2a of barrel 2, preferably by the machining of the actual material of barrel 2. This thin cylindrical wall 2b defines an interior surface that is a continuation of the barrel bore surface, an exterior surface that can be adjusted to the interior surface of chamber 3, and a final perimeter edge 2c. Fig. 3 shows the barrel 2 in the resting position, in which the sealing elements 2b, 2c of the rear end 2a of barrel 2 face the chamber 3, which contains a pellet 9a. The thin cylindrical wall 2b is arranged so that, when the barrel 2 is moved backwards by the trigger 5 (see Fig. 4), the thin cylindrical wall 2b enters the chamber 3, collecting along the way said pellet 9a, which is located in the chamber 3, until said final perimeter edge 2c is supported against the rear surface 24 of the chamber 3, making sealed contact around the compressed gas entrance 25, while said exterior surface isolates the chamber 3 from an opening 8a in the ammunition magazine 8.

[21] Typically, said ammunition magazine 8 comprises an ammunition store 19 for a column of pellets 9, where this store 19 communicates with said chamber 3 through said opening 8a. An ammunition push mechanism 20, operated by spring 21, is arranged to push

said column of pellets 9 towards the chamber 3. In accordance with this invention, a trap 22 jointed with respect to a shaft 23 is arranged in said opening 8a between said ammunition store 19 and the chamber 3, so that it is pushed upwards by the penultimate pellet 9b in the column. In the resting position shown in Fig 3, trap 22 is raised and with one end between the last and penultimate pellets, 9a and 9b, respectively. Trap 22 has a transverse section profile that is suitable for retaining the pellet 9a in the chamber 3 and to act as a cam when it is pushed by the thin cylindrical wall 2b of the rear end 2a of barrel 2. In the firing position shown in Fig 4, the thin cylindrical wall 2b, dragged by the trigger 5, has penetrated inside the chamber 3 and the final perimeter edge 2c has pushed trap 22 downwards, which has dragged the penultimate pellet 9b and with it, the rest of the column of pellets 9 against the force of said spring 21 of the ammunition push mechanism 20, thus freeing pellet 9a, which has been inserted into the rear end 2a of the barrel 2, which now acts as the chamber 3, just as was described above. Valve element 12 has been moved under the impact of the hammer 6, as will be described below, until it makes contact with a seal 56 at the opening of passageway 25. The valve element 12 is a conventional type and comprises an operating end 12a (see Fig. 2) which is struck by the hammer 6, and an axial passageway 12b with a front opening facing passageway 25 and one or more rear openings that are blocked off by a seal 57 when the valve element 12 is in the resting position and which opens in the valve chamber 11 when the valve element 12 is in the firing position.

[22] The upper section of barrel zone 1 also comprises a sliding cover 13 linearly guided to make a rocking movement in a direction parallel to the barrel 2 axis. The rear end of said sliding cover 13 includes links 14, 16 with said hammer 6, which are described in

more detail below with reference to Figs. 6 and 7 and are linked to said trigger 5 so that when the trigger is pressed, it moves the sliding cover 13 backwards, thus performing the actions of cocking and firing the hammer 6 through the motion of said links 14, 16 in synch with said backwards movement of the barrel 2. A helicoidal compression spring 48 is arranged around the barrel 2 and compressed between the front interior end 13a of the sliding cover 13 and a surface of the support casing 26 or a body joined to this in order to push the sliding cover 13 forwards to the resting position.

[23] Figs. 5 and 6 show the installation of the trigger 5 in said trigger zone 4. A pair of pieces 59, 60 shown in Fig. 8, facing each other, and joined together by means of screws 61 and fixed in place with respect to the casing 26, define between them, a guide for barrel 2, a housing 64 for a trigger piece 5a that is an integral part of the trigger 5, and slots of guide 62, into which are inserted protuberances 63 which laterally extend over said trigger piece 5a so that the same is able to slide into said housing 64 linearly guided by the guide slots 62 in a direction parallel to the barrel 2 axis. The trigger piece 5a comprises drag snugs 44, preferably provided by the ends of a pin (Fig. 8), which extend laterally from the same and interfere with internal stops 45 of the sliding cover 13 in order to drag it. Just as described above in reference to Fig. 2, the trigger piece 5a includes a cavity 46, into which is inserted a catch 47 that is firmly attached to the barrel 2 in order to drag it. Between said catch 47 and wall contacts in said cavity 46, is free play to permit a delay in the beginning of barrel 2 movement with respect to the start of trigger 5 movement and to guarantee less barrel 2 movement when trigger 5 is pressed as when it is free.

[24] Fig 5 also shows an automatic safety catch 39 linked to trigger 5 so that said safety catch 39 interferes with a fixed stop 41 inside the sliding cover 13 when trigger 5 is in said resting position (Fig. 6), preventing any voluntary or involuntary movement of the sliding cover 13 independently of trigger 5 movement, which could produce firing. The catch 39 is separated from the path of said stop 41 by the trigger 5 when this is pressed (Fig. 7), allowing movement of the sliding cover 13 by the trigger 5. This automatic safety catch 39 is connected to the arm 40 installed on part 59 fixed to the casing 26 so that it is able to pivot with respect to axis 53. Said arm 40 incorporates a linear guide 54, along which snug 55 slides joined to the trigger 5 or trigger piece 5a, by which a backwards movement of trigger 5 produces a downwards movement of automatic safety catch 39 just as shown by the broken lines in Figs. 5, 6 and 7.

[25] Figs 6 and 7 show said links 14, 16 of the sliding cover 13 with the hammer 6. A pawl 14 is articulated by a pin 52 loaded by a spring 15 and a protuberance 16, which extends laterally over the hammer 6. The hammer 6 is mounted on the rear section of casing 26 so that it can pivot with respect to shaft 17 and is pushed by a spring 18 (see Fig. 2) towards a position in which a stud 58 fixed at its distal end is in contact with the operating end 12a of the valve element 12. In the resting position shown in Fig 6, the sliding cover 13 is in its front position, the hammer 6 is in its position of contact and said pawl 14 is coupled with said protuberance 16 of the hammer 6. When the sliding cover 13 is moved linearly backwards by the trigger 5, said pawl 14 drags along said protuberance 16 and causes the hammer 6 to pivot backwards against the force of said spring 18 until it reaches the firing position shown in Fig. 7, in which, in virtue of the curved path of protuberance 16, this

escapes from the pawl 14 and spring 18 pushes the hammer 6 to cause said impact on said valve element 12. Just as was described above, this is produced in sync with the movement of the barrel 2 in order to isolate the chamber 3. When the trigger 5 is then freed, the sliding cover 13 returns to the resting position and forces the pawl 14 to exceed the protuberance 16, pivoting against the force of spring 15.

[26] As shown in Fig. 1, the pistol comprises a voluntary safety element 42 mounted on the exterior of an upper section of the stock zone 7 so that it can be voluntarily pivoted between a locked position, in which a tooth 42a of said voluntary safety element 42 fits into a recess 43 in said sliding cover 13 and a free position in which said tooth 42a is not fitted into said recess 43. By immobilising the sliding cover 13, this voluntary safety element 42 prevents the operation of trigger 5 from producing firing of the pistol. Casing 26 of the pistol also includes longitudinal channels 65 on both lower sides of the barrel zone 1, which are adapted for accepting various accessories.

[27] Fig. 9 shows a casing 27. The support casing 26 is hollow in the stock zone 7 (see Fig. 2) and is open at the lower end to receive said casing 27, which includes said ammunition magazine 8, together with the chamber 3; a cavity 28 for housing the pressurised gas cylinder 10, with a perforation needle 50 that perforates a gas exit in the pressurised gas cylinder 10; a valve body 29, which defines said valve chamber 11, and which holds said valve element 12; and a sliding protector 30 configured and arranged to cover said operating end 12a of the valve element 12 when said casing 27 is removed from the stock zone 7. This sliding protector 30 is pushed by a spring 31 towards a position of protection, as shown in Fig. 9, in which one end of the sliding protector 30 covers the operating end 12a

of the valve element 12, thus preventing any involuntary operation of the valve element 12 that could cause an unintended expulsion of the pellet 9a located in the chamber. Inside the stock zone 7 (see Fig. 2) is a stop 32, which makes contact with the sliding protector 30 and holds it in a retired position against the force of said spring 31 when the casing 27 is installed in the stock zone 7. A retainer 33, which is of a known type, is arranged in the support casing 26 (see Fig. 1) so that it can be operated from the exterior in order to retain the casing 27 in the stock zone 7 against the force of the spring 31. When said retainer 33 is freed in order to extract the casing 27, the sliding protector 30 acts as an expulsion mechanism in virtue of the force provided by the spring 31.

[28] Casing 27 also comprises a lower cover 34 articulated with respect to a shaft 36 and fitted with an elastic lock catch 37. Said lower cover 34 defines an interior cavity for housing and protecting, when in a closed position, a lock wing nut 38 for the pressurised gas cylinder 10. As can be better appreciated in Figs. 1 and 2, the lower cover 34 defines an exterior surface that extends and ends below an exterior surface of said hollow casing 26 in the stock zone 7, when the casing 27 is installed in the stock zone 7.

[29] One skilled in the art could introduce modifications or variants without leaving the scope of this invention as defined in the included claims.